

Investigation

3

Solving Equations

A problem often requires finding solutions to equations. In previous units, you developed strategies for solving linear and quadratic equations. In this investigation, you will use the properties of real numbers to extend these strategies.

3.1 Solving Linear Equations

How do you solve the following linear equation for x ?

$$100 + 4x = 25 + 7x$$

Getting Ready for Problem 3.1

The steps below show one way to solve $100 + 4x = 25 + 7x$.

$$100 + 4x = 25 + 7x$$

$$(1) \quad 100 + 4x - 4x = 25 + 7x - 4x$$

$$100 = 25 + 3x$$

$$(2) \quad 100 - 25 = 25 + 3x - 25$$

$$75 = 3x$$

$$(3) \quad 75 \div 3 = 3x \div 3$$

$$25 = x$$

- Provide an explanation for each numbered step in the solution.
- The solution above begins by subtracting $4x$ from both sides of the equation. Could you begin with a different first step? Explain.
- How can you check that $x = 25$ is the correct solution?
- Describe another method for finding the solution to the equation.

The example in the Getting Ready uses the **properties of equality** that you learned in *Moving Straight Ahead*.

- You can add or subtract the same quantity to both sides of an equation to write an equivalent equation.
- You can multiply or divide both sides of an equation by the same non-zero number to write an equivalent equation.

You will continue to use these properties as well as the Distributive and Commutative properties to solve more equations.

Problem 3.1 Solving Linear Equations

- A.** A school choir is selling boxes of greeting cards to raise money for a trip.

The equation for the profit in dollars P in terms of the number of boxes sold s is:

$$P = 5s - (100 + 2s)$$

1. What information do the expressions $5s$ and $100 + 2s$ represent in the situation? What information do 100 and $2s$ represent?
2. Use the equation to find the number of boxes the choir must sell to make a \$200 profit. Explain.
3. How many boxes must the choir sell to break even? Explain.
4. Write a simpler expression for profit. Explain what information the variables and numbers represent.
5. One of the choir members wrote the following expression for profit: $5s - 2(50 + s)$. Explain whether this expression is equivalent to the original expression for profit.

- B.** Describe how to solve an equation that has parentheses like $200 = 5s - (100 + 2s)$ without using a table or graph.

- C.** Solve each equation for x when $y = 0$. Check your solutions.

1. $y = 5 + 2(3 + 4x)$

2. $y = 5 - 2(3 + 4x)$

3. $y = 5 + 2(3 - 4x)$

4. $y = 5 - 2(3 - 4x)$



ACE Homework starts on page 45.